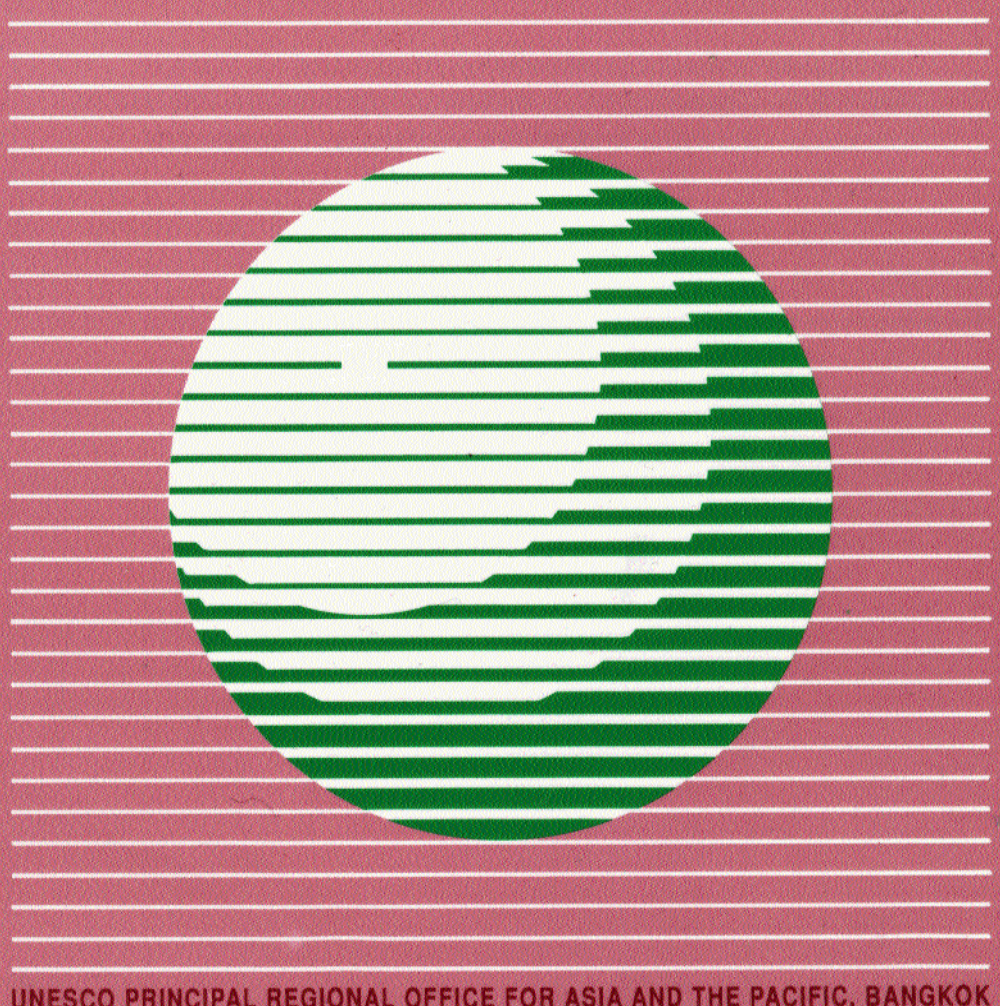


Asia and the Pacific Programme of Educational Innovation for Development

Strategies and Methods for Teaching Values in the Context of Science and Technology



UNESCO PRINCIPAL REGIONAL OFFICE FOR ASIA AND THE PACIFIC, BANGKOK

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INTRODUCTION

In accordance with the 1991 Programme of Activities in Science and Technology Education of the Asia and the Pacific Programme of Educational Innovation for Development (APEID) of UNESCO, PROAP, a Regional Experts' Workshop on Development of Strategies and Methods for Teaching Values in the context of Science and Technology was convened jointly by UNESCO-PROAP/Asian Centre of Educational Innovation for Development (ACEID), the Malaysian National Commission for UNESCO and the SEAMEO Regional Centre for Education in Science and Mathematics (RECSAM). The workshop was held from 18 - 29 November 1991 in Penang, Malaysia.

Objectives of the Workshop

The Regional Experts' Workshop with reference to science and technology education at the primary and secondary levels, developed exemplar training materials on the teaching of values. More specifically the workshop developed the framework on:

a) the objectives and content of values education;

b) the strategies that should be emphasized in the teaching-learning process;

c) the different ways of evaluating the learning outcomes; and

d) how to translate (a), (b), and (c) into materials for teacher training. Based on (a) to (d), the exemplar materials for teacher training were developed.

Participants

There were thirteen participants from Bhutan, China, India, Indonesia, Iran, Malaysia, Maldives, Nepal, Philippines, Thailand, the Socialist Republic of Vietnam and SEAMEO-RECSAM (2). Three resource persons from the Ministry of Human Resource Development, India; Curriculum Development Centre, Ministry of Education Malaysia; and SEAMEO-RECSAM, Malaysia, assisted in this workshop. There were six observers from India, Malaysia and SEAMEO-RECSAM. UNESCOPROAP/ACEID was represented by its Specialist in Science and Technology Education (Annex 2).

Office Bearers of the Workshop

The following were elected as office-bearers of the workshop:

- Chairperson: Dr. S.T.V.G. Acharyulu (India)
- Vice-Chairperson: Mr. Ismail B. Othman (SEAMEO-RECSAM)
- Rapporteur-General: Dr. Twila G. Punsalan (Philippines)

Mrs. Lucille C. Gregorio (UNESCO-PROAP/ACEID) and Mrs. Perla S. Roxas (SEAMEO-RECSAM) acted as secretaries of the workshop. Substantive and technical support was provided by the members of the Directorate, professional and administrative staff of SEAMEO-RECSAM.

Workshop Activities

The deliberations took place in plenary and group sessions. The members of the Organizing and Steering Committee took time to meet at the end of each day to assess the progress of the activities and the plans for the next days' work. Measures were adopted to ensure that the plans were implemented efficiently.

During the development of materials, the participants, resource persons and observers worked as a team and with technical support from the RECSAM staff.

Some participants brought printed materials, video programmes, slide-tapes and sample lessons to illustrate the teaching of values in the context of science and technology. These were displayed for the members of the workshop to examine during their free time, and to use as resource materials in developing their exemplar materials.

The document, Values and Ethics and the Science and Technology Curriculum, UNESCOR APEID, a product of a Technical Working Group convened by UNESCO/ACEID, acted as a substantive guideline for the workshop activities.

Inauguration of the Workshop

The workshop was inaugurated by the Director of SEAMEO-RECSAM, Tuan Hj. Mohd. Khairuddin B. Hj. Mohd. Ashaari. He welcomed all those who came for the meeting and hoped that they will have a pleasant stay in RECSAM and in Penang. He pointed out the significance of the workshop and how science and technology

education could play a major role in the development and promotion of proper values.

Mrs. Lucille C. Gregorio of UNESCO-PROAP/ACEID set the direction of the workshop by presenting the science and technology education programme of UNESCO, in line with the thrust following the Jomtien Conference: «*Education For All*»; and the UNESCO-PROAP/ ACEID Programme in «*Science and Technology Education For All*", "*Improvement of Quality of Science, Technology and Mathematics Education*". She also presented information about the different workshops conducted worldwide on «Values and Ethics in Education» which acknowledged that values and attitudes are very important in education and for improving the quality of life. She then discussed what was expected from the workshop and presented numerous, crucial and diverse problems in the Asia and Pacific region related to poverty, explosion of population, unemployment, health hazards, destruction of the environment and others. She hoped that the strategies, ideas and exemplar materials developed will be of use in the training of teachers who ultimately will translate them effectively into teaching-learning experiences in the primary and secondary level classrooms.

Adoption of the Report and Closing of the Workshop

The workshop report was deliberated and adopted on the last day of the workshop with recommendations for follow up at local, national and regional level.

Chapter One

SYNTHESIS OF COUNTRYPAPERS: 'TRENDS AND ISSUES'

This chapter presents a synthesis of country papers presented by the participants. It includes the objectives and content, strategies for teaching-learning, methods of evaluation, and the development process in teaching values in the context of science and technology. From the country presentations and academic papers, the emerging trends and issues have been identified.

BHUTAN

Introduction

Notwithstanding the existing aspects of values and ethics education developed over a period of time and practiced at individual school levels in the Kingdom of Bhutan, there are no detailed analyses of what constitutes value education. Values education is implicit rather than explicit in the Bhutanese context.

The schools, through dedicated and loyal teachers, have an important role to play in helping children to understand the world they live in and preparing them for adult life and work. Lee Department of Education attaches considerable importance to science education and to the constant effort to inculcate in Bhutanese children traditional values and ethics so that he/she grows to be a dedicated, loyal, and industrious citizen in the highest of Bhutanese traditional virtues not forgetting to use science and technology as a tool or key to the development of the individual and the country.

Objectives and Content

While values/ethics education in the scientific and technological fields is yet to be tried out explicitly, the objectives of science education are as follows:

a) Science cannot offer an adequate explanation of one's world, so science education needs to be related to other areas of the curriculum;

a) Science cannot offer an adequate explanation of one's world, so science education needs to be related to other areas of the curriculum;

b) Future citizens should know the practical application of science and technology and the ways they are changing society and economy;

c) Future citizens should explore some of the moral dilemmas that scientific and technological developments can cause; and

d) Science education should explore the social and historical context of scientific discoveries.

In the statements of attitude education the intentions are explicit. Adaptability, commitment, cooperation, reliability, self-confidence, self-discipline, perseverance, tolerance, empathy, providing consideration to others, curiosity, honesty, integrity etc. are expected to be encouraged in science lessons during the learning process.

Strategies for Teaching-Learning

The science curriculum, along with other curricula, helps to develop a complex of attitudes and behaviours based on implicit values and ethics, such as valuing, caring, being responsible, making decisions and taking action, core values of responsible adulthood. These are integrated with traditional values since Bhutanese people have inherited a rich and unique value system from elders, whose basic tenets include some of the special importance to the education system, particularly love for and admiration of nature and people.

Methods of Evaluation

The science curriculum coupled with the inherent values can be evaluated by spot judgement of teachers of the ways a student behaves while performing a particular activity and how the behaviour expected is exhibited. The teacher summarizes the values attached to the lesson/topic and records the student's achievement through continuous assessment.

CHINA

Objectives and Content

Ethics/moral education is highly valued in China. Relevant policies and regulations were made by the government. The syllabus/ teaching programmes and textbooks reflect those policies and regulations.

The Government Policies:

a) The education policy must enable everyone who receives an education to develop morally, intellectually and physically.

b) In primary schools students need to be educated on five «loves», love for motherland, love for people, love for work, love for science, love for socialist system and to foster the students' good values and cultivate their good behaviour.

c) In secondary schools the stress is on patriotism, humanitarianism, responsibility to society, meaning of life, etc.

d) Some detailed rules and regulations have been laid down by the State Education Commission and authorities at all levels.

In the Teaching Programmes

In the teaching programmes of all the science subjects, there are stipulations about ethics/moral education. They are concentrated mainly on dialectical materialism, practical and realistic points of view, scientific approach, environmental awareness, patriotism, etc.

In the Textbooks

The textbooks are developed according to the teaching programmes, and contain materials for ethics/moral education, in particular, loving science; scientific approach; patriotism; scientific point of view on the natural world; and international and global consciousness.

Strategies for Teaching-Learning

The strategies for teaching-learning are such that they exert an imperceptible influence on students' thinking; use elicitation method, inspire the students; suit the students' age, physiology and psychology, and pay attention to teacher training.

Evaluation

Practical results are emphasized. The results of value teaching will be indicated by the behaviour of the students. Teachers always set some demands on the students' behaviour. The evaluation itself can cultivate good habits of action among the students.

INDIA

Values education is stressed in the educational system and concerns for it and its aims are reflected in the reports of different National Level Commissions, and committees.

Objectives and Content

Objectives

The objectives in teaching values are:

a) to provide a realistic and broad-based understanding of human values and to educate/train students to become responsible citizens in their personal and social lives;

b) to develop and promote among students, values such as truth, humility, honesty, perseverance, cooperation, love, compassion, peace, non-violence, courage, equality, duty, morality, kindness, piety and righteousness, dignity of labour, concern for others and a small family norm;

c) to enable students to understand, appreciate, uphold, protect and promote the sovereignty, unity and integrity of India and the national goals of egalitarianism, socialism secularism and democracy besides imbibing values enshrined in the Indian Constitution;

d) to protect, preserve and conserve the natural and cultural environment and to make judicious use of natural resources;

e) to develop scientific temper and spirit of scientific inquiry and capacity for independent and original thinking;

f) to understand, appreciate, promote and use knowledge of Science and Technology for enhancing productivity and human happiness;

g) to safeguard public property, remove social barriers and renounce the practice of violence, cheating, corruption and destructive tendencies;

h) to sharpen the intellect, build character and self-discipline essential for creative pursuits in science and technology;

i) to offer science education conducive to the development of physical, intellectual, moral, social, spiritual and economic aspects of life; and

j) to enable students to distinguish between good and bad, right and wrong and acquire intellectual wisdom and disposition to do what is ethically correct and good.

Content

Moral education is taught frequently as a separate subject. There is, however a growing trend to regard all teachers as teachers of Value Oriented Education and all school subjects and activities as lending themselves to the formation of values. The correlation of values with science teaching has been attempted to an appreciable extent. However, Value Oriented Science Education (VOSE) requires much more intensive efforts.

Strategies for Learning-Teaching

Two basic approaches - direct and indirect (curricular and non-curricular) are discernible. The direct (curricular) approach includes the isolated subject approach and the integrated subject approach. The trend is towards integrating values with all school subjects. The indirect approaches supplement the efforts made through direct approaches. The importance of science clubs, exhibitions, museums, quiz programmes, field trips etc. are stressed. Institutional climate, training (both pre-service and in-service) and commitment, availability of instructional materials, community involvement and a host of

other factors determine success. Multiple strategies have to be developed and used through multimedia approaches. The methodologies/strategies/ activities need to be flexible.

Methods of Evaluation

Evaluation has to be continuous, comprehensive and improvement oriented. Evaluation of cognitive components is easier than non-cognitive ones. The affective qualities are general and not content, class/grade or age specific. The use of teachers' ratings, developmental values profiles of pupils, recording of observations of pupil participation in science activities and maintenance of cumulative records, peer ratings, pupils' self-appraisal, parent reports etc. for evaluating values have been emphasised.

INDONESIA

Introduction

In Indonesia, values education is derived from PANCASILA, the state philosophy of the Republic of Indonesia or the Five Integrated Principles of Indonesian way of life. Each principle is independent of, but supplements one another. They are: Belief in the Supreme God, Just and Civilized Humanity. Unity of Indonesia, Democracy led by the wisdom of deliberation amongst representatives, social justice for the whole of the people of Indonesia. Pancasila is also used as the philosophy of education in Indonesia, therefore national educational goals are based on Pancasila. In the context of science education, the values of science education should be in tune with the values which are reflected in the thirty-five Rules of Pancasila.

Objectives and Content

Objectives

The objectives in teaching values are:

a) to inculcate positive attitudes and values toward science and technology;

b) to increase the awareness of the relationship among science, technology, human beings and environment concerning its influence and effect on each other;

c) to develop personal attributes and attitudes. Among these are curiosity, originality, perseverance, open-mindedness, self-criticism, responsibility, willingness to cooperate and independence; and

d) to develop social attitudes. Among these are: to be aware and critical of current issues with respect to changes in society and to be confident in contributing and paying attention to the needs of society.

Content

A broad and balanced content encompassing the two aspects of the environment, namely the natural environment including the physical and biological environment, and man-made environments is designed. There are also several topics related to everyday problems and issues such as ecological problems, community based problems, health problems, and local materials.

Strategies for Teaching and Learning

A multi-pronged approach is used for teaching values in the context of science and technology. These methods include problem solving, debate, discussion and project work. There is also an attempt for promoting motivation in learning science. In this attempt, a guide for teachers is designed. Cognitive conflicts, self concepts, and modelling are used in this guide.

Methods of Evaluation

Evaluation of attitudes in science education is done by *«Direct observation»* and *«Likert-type scaling»,* but, they do not seem to give satisfactory results. Recently, there was an attempt to develop a teacher's guide for developing attitudes, and values in science teaching. However, it did not include assessing attitudes and values which are derived from the national goals.

THE ISLAMIC REPUBLIC OF IRAN

Introduction

The human being has a moral existence and consequently his development in morality is essential for his perfection. So, there should be a balance between the expansion of man's technological and scientific power and the development of his moral capacity.

It is a fact that there are different moral and value systems in the world but still there are some basic universal moral principles among all of them. Basic values arise in human nature and as human nature is unique, differences in colour, race, time or space do not change it. The basic moral values are common among all people in all countries.

In the Iranian context, the segregation among the three basic principles, i.e., religion, morality and science does not benefit any one of them. The progress in science itself cannot create morality. Religion in its purified form can provide the foundation for the promotion of morality and block the uncontrolled progress of technology. One can take advantage of religion, as a supporter of virtues and values, in the education system.

It is believed that it is not possible to promote the standards of moral values merely via formal education. It is necessary to create an atmosphere in which moral values and humanity can flourish naturally.

Objectives

The objectives in teaching values are for the students to: appreciate nature and its creator; consider nature and its laws and phenomena as the manifestation of will of the Almighty God; be honest; cooperative; not be lavish and wasteful; open-minded; respect logic and be rational; not being selfish; be eager to acquire knowledge; and believe in equality and reject discrimination and exploitation.

Strategies for Teaching-Learning

The main part of value formation is usually done by the teacher. Concerning curriculum, indirect methods work well.

Methods of Evaluation

a) Pen and paper method
b) Observation
c) Reports of students

MALAYSIA

In the new curriculum, due emphasis is given to the intellectual emotional, physical and spiritual domains at all school levels. Values are assimilated in all subjects including science. It is the responsibility of all teachers to mould children into becoming good citizens.

Objectives

Moral education is offered as a core subject at both primary and secondary levels, and it is made compulsory for all pupils, except Muslim students. The programme aims to assist pupils to identify, clarify and internalise certain values. The overall objective of Moral Education is the development of an individual who recognizes, accepts and internalises his role as a responsible decision maker pertaining to moral issues in a democratic society such that his actions are governed by moral principles in all situations.

The science programme under the Integrated Secondary School Curriculum (KBSM), emphasizes the acquisition of knowledge, scientific skills and inculcation of moral values. This is in line with the National Philosophy of Education, where individuals are developed holistically. Moral values in science comprise universal values and intrinsic values. Universal values are values accepted by all members of the society, such as honesty, respect, diligence and cooperation. Intrinsic values are values related to science such as being objective in organising and reporting results of scientific investigations, valuing and practising clean and healthy living.

Strategies for Teaching-Learning

Various teaching-learning strategies are recommended in the new curriculum, but emphasis has been placed on strategies that involve students' active participation. Various approaches can be used in the teaching of moral values, such as indoctrination approach, value analysis approach and cognitive moral developmental approach. Each approach involves techniques such as discussion on moral dilemma episodes, singing songs, making posters and holding debates.

Methods of Evaluation

The purpose of evaluation is to evaluate the objectives of the curriculum, provide information that can help in teaching-learning processes and thus further improve it. Evaluation can be done through various methods such as completing short stories, paper and pencil tests, using Likert Scales or Semantic Differential, interviews and assessment on students' projects or laboratory reports.

Training the Teachers

Before implementation of the new curriculum, i.e. since 1982, inservice training/courses were conducted for teachers in science. The Curriculum Development Centre (CDC) was given the responsibilities to conduct these courses. Key personnel were trained by CDC and then, later, trained science teachers at state level. The **'Package System'** was introduced in 1990, where all schools were provided with video programmes accompanied with supporting documents. With these packages, schools are to run courses at school level with the help of key personnel.

REPUBLIC OF MALDIVES

The Context

Values/ethics education has been a feature of the Maldivian education system ever since education, as an organized activity, began. Maldives being a 100 per cent Islamic country and having been so for the last eight centuries; religion and culture play an important part in values/ethics education. In recent years, moral and ethical issues have assumed a great importance in the Maldives because young people of today face special problems and obstacles, such as the increasing size of school-going population; and the ease of exposure to pluralistic values, for example, through video films, media television and tourism even while the children are at formative years.

Objectives and Content

Faced with the ethical challenges of the 1990s, Maldives has intensified its efforts at instilling a comprehensive set of values/ethics in children. Maldives is lucky in that it has a singular religion. Most of the content of the values/ethics education is derived from Islam, which as Maldivians see it, is more than a religion - it is a way of life. The values/ethics to be taught are not specified in the form of a syllabus. But most documents have references to these values. For example the Recommendations of the National Conference on Primary Education held in 1985 noted that: the curriculum should incorporate content and learning activities which would help to instill in the students respect for their religion and to attain good conduct.

According to the revised syllabus (1990), some of the objectives of teaching science at middle school are to develop attitudes such as being objective; truthfulness and integrity; avoiding conclusions based on insufficient data; and respect for logic and opinion of others.

Strategies for Teaching-Learning

The traditional methods of teaching values/ethics have been through exhortation and expectations. The former involves the teachers telling the children what is right and what is wrong. It involves urging the students to behave. In the hidden curriculum, ethical values are taught by expecting certain standards of behaviour from the students. Some of these expectations are made known to the stu-

dents as school rules. Teachers have been responsible for much of the values/ethics education. They are a powerful force in shaping students' values. The prevalent strategies of values/ethics education employ teachers as the medium. Teachers can be a powerful example. Informal values/ethics education now takes place generally through discussion by the teacher in various subjects. While many teachers are examples of moral excellence, a few make less than admirable examples. This has been a serious shortcoming of teaching values/ethics through examples. Values/ethics education is too important to be left only to the Islam teacher. These values are being instilled in the students through science classes for example, by encouraging students to report experimental results truthfully, and by organizing group activities in which students learn the value of cooperation, respect for others and appreciation.

In Maldives, schools normally start with an assembly. The assemblies and meetings are used to inculcate values/ethics principles in students.

Methods of Evaluation

At the primary level, some evaluation of values/ethics education takes place through written work, assessment of social behaviour, attitudes towards co-operation, sharing, prejudice and environment. Children's development of values/ethics are graded only in the preschool level. Presently, it is not easy to introduce values/ethics education components in science and technology education, since the students are being prepared for external examinations.

At present, Grades 6 and 7 Science textbooks are being written in the Maldives to replace the exogenous materials. It offers a wonderful opportunity to incorporate values/ethics components in the science syllabus.

NEPAL

Objectives and Contents

Objectives

Some of the major objectives of Science Teaching at school level are as follows:

a) to attain basic knowledge about scientific words, facts and concepts, strengthen knowledge of life processes, behaviour of and inter-relationships between, plants and animals, and to make use of them.

b) to develop pupil's skills in solving everyday problems by means of scientific knowledge; c) to develop the ability to find cause and effect; d) to acquire knowledge and practical skills to conduct simple experiments;

e) to acquire the capacity to apply scientific knowledge in solving day to day problems;

f) to develop the habit of observing and reporting results of experiments and measurements honestly and truthfully; g) to develop habit of deciding on the basis of real facts;

h) to develop the habit of working hard and appreciate the contributions of science and scientists for human happiness;

i) to acquaint pupils with natural phenomena and processes taking place in the physical environment; and

j) to develop the pupils' ability to pursue creative, scientific activities.

Content

Values are integrated with subjects like language, social studies, science etc. at the primary level. Values related to science and technology are given greater importance at the secondary level.

Science has been integrated with health education from grade IV to grade VIII, and is treated as a separate subject in grades IX and X.

Strategies for Teaching-Learning

In line with the science curriculum, practical science activities and simple laboratory experiments by students are conducted. It is done dither individually or in groups, under the guidance and supervision of the teacher. Students are trained in observation, collection of data, and interpretation skills. Demonstration by the teacher in a small group as a method is also being used. The observations and data obtained through these activities are extensively discussed by students with their teacher. Besides these, field trips are also a part of the teaching-learning process. They provide first hand experiences to the pupils which are not possible in the classroom situation. All of these activities in fact involve pupils learning, and developing skills and values.

At the primary level, maximum time is devoted to practical activities. But at the secondary stage, in addition to practical activities emphasis is given to quantitative and mathematical aspects i.e., accuracy in measurement, problem solving and decision-making.

Methods of Evaluation

Evaluation is a continuous process in the teaching-learning situation. It is done after the completion of a lesson in the classroom, through observation, home work, as well as by unit tests. These types of evaluation are useful for the teacher to find out the strengths and weaknesses of his pupils. In addition, examinations are also held at the end of the year. Both formative and summative evaluations are used.

PHILIPPINES

Objectives and Content

The Science and Health Programme at the elementary level «aims to develop an understanding of how science relates to everyday life, the comprehension of the environment and the acquisition of scientific skills, attitudes and values necessary to solve everyday problems. The goal as a health programme is the development and promotion of knowledge, attitudes, values and behaviour essential to the individual, family and community health».

The 1989 secondary science and technology programme «aims to develop the student's competence, skills and values relating to science». On top of the science concepts and process skills, the students are expected to demonstrate scientific values and desirable attitudes such as: intellectual honesty; open-mindedness; curiosity about natural phenomena and technological advances; persistence and love for work; recognition of the tentativeness of scientific findings; awareness of the limitations of science; respect for life; co-operation in working with others; ecological concern and appreciation of the unity, order and beauty of nature; objectivity; critical judgement; and resourcefulness.

Strategies for Teaching-Learning

For a purposive and systematic integration of values in different subjects including Science and Technology, the ACES (AffectiveCognitive Experiences for Self-Integration) Approach is used by trained teachers both at the elementary and secondary levels. This strategy is used in addition to the natural infusion of values in the subject and other off-class activities. The ACES teaching approach is based on the confluent theory of education which provides for the flowing together and interaction of the affective and cognitive elements in individual and group learning. Using the ACES makes the integration of values more purposive (rather than incidental) and systematic (rather than sporadic). Values integration is carefully planned and woven in the subject without sacrificing the content of the subject prepared for the day's lesson.

The following illustrates the phases of learning in the ACES methodology.

Phase I	Phase II	Phase III	Phase IV
Learning Trigger (Structured Learning Activity)	Value Clarification (Analysis)	Directive (Abstraction)	Action (Application)

Methods of Evaluation

Values as a part of human behavior are manifested in three dimensions: (a) awareness or value concepts; (b) feelings and attitudes; and (c) characterisation and action. Therefore, values may be measured in these dimensions depending on the objective of the lesson.

Some of the more common evaluation strategies used for assessment of value learning are:

a) self-report strategy as the most common strategy for assessing affective states through data gathering tools such as rating scales, checklists, inventories, completion tests, multiple choice, semantic differential, likert scales;

b) situational test essentially places the student, by simulation through situational items closely resembling a real-life situation; and

c) projective technique in a relatively unstructured task. The way in which the individual perceives and interprets the material will reflect fundamental aspects of his values. Examples commonly used in Values Education are the thematic or pictorial technique, comic strips and sentence completion.

THAILAND

Objectives

The structure of the school system in Thailand is a 6-3-3 plan, whereby six years of primary education is compulsory, followed by three years of lower secondary and three years of upper secondary education. Science is a required subject at all levels. The secondary school curriculum offers elective courses for those who are specially interested in science.

Strategies for Teaching-Learning

The teaching Ad learning of science at different levels in Thailand aims at providing knowledge and skills as well as ethical values. The objectives related to values and ethics at each level as prescribed by the Ministry of Education must be evaluated also e.g. interest in pursuing further knowledge, recognition of the importance of science, a good attitude towards science, Seductiveness, broad-mindedness, self-discipline, frugality, responsibility, perseverance and ability to work with others within the principles of co-operation.

There is an Implementation Guide in the curriculum. In this regard, ethical values ought to be developed in parallel with science and technological knowledge in learning/teaching and other activities at all levels. The Implementation Guide is a strategy to indicate to supervisors, school administrators and teachers the awareness of the importance of values and ethics which will bring about happiness and well-being to the learners.

Methods of Evaluation

The methods of evaluation are the responsibilities of school administrators and classroom teachers at all levels and are carried out through formative and summative evaluations. For summative evaluation, the cognitive, affective and psychomotor domains and process skills are taken into consideration. However, most teachers would observe the learner's behaviour in evaluating values and ethics.

VIET NAM

Objectives and Content

Ethical education of students is a very important duty for every civilized society. Chemistry is not among the Humanities. However, ethical education can be carried out through the specific characteristics of the discipline.

On the **"concepts"**, **"objectives"** and "**tasks**" of ethical education, there are four categories of ethics, i.e. Individual ethics; Man-to-man ethics; Man-to-occupation ethics; Man-to-Nature ethics.

The objective of ethical education in the teaching of chemistry is to help train the young generation to become creative working people for national development.

The contents and methods of ethical education through the teaching of chemistry emphasises: education for the love of the homeland; education of scientific confidence; aesthetic education; protection of environment and mankind's natural resources; and population education.

Strategies for Teaching-Learning

The objectives of ethical education through the teaching of chemistry are directed to the following tasks:

a) education of students on good qualities like discipline, confidence, creation, accuracy, diligence, seriousness and humaneness;

b) providing students with knowledge of the general techniques and technology of chemistry;

c) giving vocational guidance, encouraging them to get into branches suited to their capacity and aptitude and to the country's demands; and

d) education of students in the love of the country, the homeland and respect for nature.

Suitable strategies are adapted in order to:

a) provide students with basic knowledge and skills as a basis for the understanding of the world and its improvement in the interest of man;

b) educate students in the accuracy of chemical science, and the fine qualities of the working people (caution, patience, labour discipline...);

c) educate students towards vocational orientation, the sense of purpose, the sense of responsibility and the voluntary choice of a career suited to their capacities and the country's economic development; and

d) educate students in such fine qualities as: protection of local environment and natural resources, love for the fruits of labour, social property, humaneness, aesthetic capacity, thrift and population education.

Methods of Evaluation

The values related to the objectives of chemical science and ethics which are evaluated are as follows:

a) testing knowledge, understanding, skill and application of chemistry in school, society and family;

b) testing knowledge of the country's natural resources, the chemical industries that are developing and will develop in the country;

c) assessing scientific confidence;

d) cognizance of the beauty of chemistry (chemical practical work and experiments);

e) protection of the national resources, the purity of living environment; and

f) assessing knowledge of the relations between chemical products and mankind's food and clothing.

RECSAM PAPERS

The two papers presented by the RECSAM staff provided some theoretical input to the workshop. The summaries are presented here.

Paper 1

In the last decade all countries over the world have seen the decline in moral values. As a result of that, there is a revival of the teaching of values in schools.

There are differences in opinions as to the way the values should be taught. One group of educators such as Dunlop and Richard Bring (1986) hold the opinion that values should be determined first. Educators like Piburn, Rath, Harmin and Simon (1976) argued that the students should do the valuing. However many educators particularly in the East are in favor of the first group and they list up the values that need to be imparted to the students. These values are considered as «**universal values**».

With regard to science education, Layton (1981) has suggested some values that need to be developed in the students. He also suggested some general approaches to the teaching of values. The approaches are:

a) Inculcation

b) Moral development, and c) Value clarification.

Various strategies and techniques could be used for teaching values in the context of science and technology. Among the strategies are:

a) Scientific investigation b) Moral biography

c) Role play

d) Dilemma story e) Field trips and outdoor camps

f) Discussion

Paper 2

At present there is a growing dissent to the neutrality of science as a free commitment to a standard of truth. The clamour is for the teaching of science and technology to be governed by a vision of how it is to be utilized for the good of the society which sustains it and which it is designed to serve. Thus, science education within this framework is geared towards producing: (1) individuals who not only will adapt to a technological society but also contribute to its growth; (2) scientists with moral responsibility; and (3) enlightened citizens capable of uplifting the status of their people and country. To achieve these objectives, explicit teaching of science and technology for value outcomes is needed. Teaching the process of learning primary values is vital. This process enables individuals to internalize the values we learn. If this process could be used in the teaching of values in class, then the chances of these values being accommodated by the children would be high. Therefore, the teaching of values that are integrated in the science lessons should go beyond transmission. It should aim for true accommodation that leads to internalisation.

Mediated instruction is one approach that could be used to teach '**process**'. Mediated instruction through modeling, guided learning and collaborative learning within an individual's zone of proximal development has proven effective in developing explicit cognitive and affective processes. The valuing process should be developed within this zone through expert guidance by capable others and collaboration with peers.

When considering value-related activities, one has to examine systematically the aims or intended outcomes of the value-related lessons. If one wishes to quantify results then these aims have to be stated in behavioural terms. Teaching-learning processes to achieve these aims have to be carefully planned for the effects. Actual outcomes are very much dependent on the means employed.

Evaluation of results for value outcomes using the aforementioned approach is rather difficult to make, especially if one prefers to do quantitative assessment. For purposes of classroom evaluation only those outcomes that are attainable under particular conditions as specified in the aims can be ascertained. The long term effects will surface much later when the values inculcated, not transmitted, have become part of the individual's repertoire of behaviours.

Trends and Issues

From the country presentations and discussions, the major trends and issues on teaching values in the context of science and technology have been identified and are listed here.

Trends

a) All countries represented recognize the significance of values development among students.

b) Each country reported core values and a basic framework, which gives directions for values development.

c) Although the countries have varying core and related values, there are indications of commonalities among them.

d) There is evidence of the recognition of the values intrinsic to Science and Technology and those related values which may be developed through values integration.

e) While there are countries which have explicit programmes for formal values integration, there are also countries which have approached values formation through inculcation (e.g. cleanliness, order, accuracy, obedience to school rules and regulations, etc.), and through religious instruction.

f) Recognizing the significance of the values development programme, there is a strong desire expressed by the countries to learn more strategies for values development, specifically for values integration in Science and Technology, and to seek possibilities of reinforcing their programmes.

g) The learning-teaching strategies presented range from inculcation strategies, to value clarification, moral, dilemma, integrated and silent approach, structured learning activities, action learning, community projects, and others. It was evident that no one strategy is best for all types of lessons.

Issues

a) Consistency between what is laid down and actual behavioural manifestation by the various actors in the scenario is essential in facilitating value formation in students.

b) As a model to the students, the values of the teacher play a vital role in values education, hence the need to train teachers for value formation and for the required competencies.

c) Stimulating teachers' favourable attitude towards values education and also to other value aspects of the macro system (value issues concerning local, national and international scope) to be considered in teacher training.

d) Value assessment is difficult because of its qualitative nature. There is a need to train teachers with the most practicable strategies that may serve as basis for assessing the degree of values formation as a result of values integration.

e) In preparing exemplar lessons for training, priority to be given to values integration in science lessons that are not naturally value - laden, for the teacher to see clearly the possibility of integrating values even in highly technical science lessons.

f) In the preparation of lessons, direct experiences to be considered over simulated ones/pictures (e.g. soil erosion, deserted forests, etc.) whenever possible.

g) Direct teaching or the purely incubative approach in values integration needs to be reconsidered in view of its reduced effectiveness on particularly adolescents who may resist this moralizing strategy.

h) A demand emerged for a suggested list of core values which cuts across programmes of the region, that may be possibly infused or integrated in science lessons.

i) Conscious efforts be made to link education programmes with the home/parents, community, agencies and media.

j) Values development to be able to incorporate religious, moral and scientific values harmoniously, without creating confusion among the students.

Chapter Two

CONCEPT IDENTIFICATION AND FORMATION OFVALUES THROUGH TEACHING OF SCIENCE

Concept of Values

Science education is one of several media through which society intends to transmit what it considers to be clear, worthwhile, helpful and valuable to the present and succeeding generations. The educational process necessarily includes components of culture and cultural heritage, norms and codes evolved over a period of time which may be closely linked to morals and ethics. Further, the inherent human tendencies to be of help and of service to fellow beings also need to be continued and strengthened. These are valuable today and perhaps valuable enough to be passed on to succeeding generations. The above refer to what are called collectively, 'values'.

The workshop in considering the concept and perception of values noted that they were linked to the various dimensions of the human person as a result of his learning and his every day experiences. Cultural heritage, traditions, and beliefs play a very significant role in shaping the individual's values. These give him a sense of purpose and meaning in life.

The individual is the focal point in any effort which intends to develop and form values. These, in an individual, are a measure of what is considered good, desirable and acceptable. Values are pragmatically perceived as qualities of human behaviour, thoughts, feelings and attitudes that need to be accepted, imbibed and cherished by the society. These encompass modes of conduct, codes and norms which every society evolves over a period of time.

Values education today forms an integral part of the education system of each participating country, spreading across levels, stages and subject disciplines. While generally the values education component is infused and integrated in appropriate subject disciplines, it is also offered as a separate course of study and learning in some. A combination of both approaches is also adopted. The interesting aspect that emerged in the workshop discussions was the commonality in trends, issues and problems. Countries are concerned with changing family structures, erosion of spiritual and moral authority, rush towards material acquisition and possessions and indigenous culture taking a back seat.

The workshop noted the use of various programmes, such as extra curricular activities, school projects, school assemblies, literacy and education campaigns for values orientation. These need to be utilized more in the future.

Values and Teaching

Education of every individual includes values components. However the workshop agreed that, it is still open to discussion as to how best this could be achieved. Could values be inculcated, cultivated or imparted? Could these be presented before the learners and are likely to be accepted? Is certain amount of indoctrination desirable? Several such questions were discussed by the workshop.

The education system alone cannot be solely responsible for values education. The parents, the community, the social and political systems also have to play a significant role and take responsibility. In education, science, as with other areas, could contribute effectively.

Scientific and technological advances have created impacts resulting in the acceleration of the process of social change which, in turn, affects economic, cultural, political and religious sub-systems. Science education is now a compulsory component of basic education systems in most of the countries, at least for the first eight or ten years. It's objectives include developing rationality and scientific attitudes among future citizens, and include the following:

a) longing to know and to understand;

b) willingness to collect data and attempt to find meaning in the exercise;

c) respect for logic and skill to utilize it; d) willingness to agree to consider premises; e) need to consider alternatives and consequences;

f) possibility of increasing happiness and quality of human life by decreasing hunger, misery and exploration;

g) replacing human labour by machine and utilization of automation, computer technology etc.;

h) need for verification; and

i) willingness to work for humanity and listen to opposite view points.

These characteristic of a scientific temper clearly project the importance of science teaching and learning in the context of values education.

In the present situation the impact of science and technology is ever growing. This, the workshop considered, added to the importance of the values component in science education. It is dependent on the development of understanding of science by the individual. Science could help in developing concern for all forms of life and the environment that sustains it. While the cognition component of science is essential, the affective is crucial to the very survival of humanity. The workshop recognized that there is a growing concern that the emphasis on affects can no more be left to 'hidden' curricula, but needs to be explicitly emphasized and enriched. The pressures of the knowledge explosion and the consequent enhanced curriculum load keeps science teachers too busy ensuring that the performance of their learners in cognitive areas is good. This needs to be checked. There should be a balance between theoretical knowledge, technological competence and the individuals moral understanding and overall appreciation of humanistic and cultural values related to science and technology.

Identification of Values

Values identified in various forms and different education systems have also listed these in different patterns. The workshop generally agreed that a major categorization could be in terms of the humanistic, moral ethical and cultural with the moral and ethical usually overlapping.

The workshop made an indicative list of positive values which were significant and directly linked to science education. Such listings has been attempted in the participating countries.

The focus of the list is on personal and social conduct.

Values education needs to prepare individuals to take decisions whenever a conflict situation arises before them. The decision should invariably be weighed in favour of rightly deserving values. Character building should be of a practical nature implying thereby determination on the part of the individual to pursue the right kind of values even in the face of difficult and adverse situations. Towards this, the school curriculum, learning-teaching strategies, and teacher preparation programmes would need a fresh look. The list prepared by the workshop gives indications for these.

Values Formation and Objectives of Learning-Teaching Science

The curriculum concerns of each nation are governed by the needs of society and individuals. These needs are changing fast and the curriculum is expected not only to meet the present needs but also to prepare the learners for the future. They may then be seeing still greater changes and would have to be equipped to absorb these and contribute their own effort as well. Most of the countries have redefined their curriculum concerns in the recent past. Some of these have completed more than one cycle of curriculum renewal and development. The teacher training programmes have also undergone significant changes. Adequate priority and weightage are being given to working with the community, skill development, vocational education and education in physical, moral and spiritual development. The emphasis on values education has emerged clearly, and mainly centres around national goals, universal perceptions, ethical, moral and spiritual considerations with particular focus on character building.

Values education could be viewed as having a corrective component which would link it to the elimination of obscurantism, fanaticism, violence, superstition, exploitation and injustice. The extent of emphasis on this component could vary in each country. There could also be a prospective component, and include values like honesty, truthfulness, courage, conviction, tolerance, love for justice, compassion etc. The workshop stressed that the school curriculum can no longer ignore the major global issues facing the world today and those which are likely to confront humanity in the near as well as the distant future. Several of them are as significant as national issues. The learners have to be made aware of the issues like peace initiatives, peaceful uses of nuclear energy, protection of culture and environment, prevention of violation of human rights, equality of others etc. They also, in this context, need to perceive themselves as members of a global community of mankind. As an example, the need for protection of the environment and natural resources in the immediate neighbourhood of the learners could help them perceive gradually the wider implications of global efforts to save the environment. One of the major thrusts of the school curriculum would be to prepare the learners to respond adequately to the need for adopting a scientific outlook. Science curricula provide opportunities to develop the qualities of open mindedness, commitment to face enquiry, habit of seeking more evidence before arriving at conclusions. It makes learners revise their assumptions and hypothesis based on fresh evidences that may come to light. It also helps in the acquisition of work skills, formation of appropriate work ethics and work habits. It moulds attitudes. The learners develop interest in the pro-

cesses of science and are able to identify areas of their interest. This gets closely linked to respect for work, productivity consciousness, and creativity. Devotion, commitment and sincerity become necessary ingredients.

Another aspect that deserves attention in developing the curriculum of science in the context of values formation is the fact that science searches reality or truth. The value of truth is the value of science. As the value of truth is an all encompassing value, the direction it provides to applications of science has to be ethical and moral, correct, justifiable and acceptable. The scientists and technologists who contribute to industrial and technological changes and developments need to have some inherent qualities. These include relentless desire for the search for truth, capacity to analyse, interpret, courage to dissent from the accepted explanations with necessary respect for the earlier contributions and willingness to present their own ideas, interpretations and analysis before others. Sense of humility and consideration for the good of humanity need to be all persuasive considerations. These qualities and considerations generate new ideas, and induce new thinking. Conditions are also created which demand reorientation of old values as a consequence of reinterpretations of new facts and findings.

The specifications of learning objectives of science subjects at the secondary stage frequently contain the following:

a) acquisition and understanding of knowledge of terms, facts, concepts, definitions, principles and processes;

b) development of relevant skills;

c) application in unfamiliar situations;

d) appreciation of the contribution of the particular subject area to scientific and technological developments and human happiness;

e) development of interest in the happenings of the scientific world; and

f) development of scientific attitudes.

In the present context, objectives pertaining to appreciation, interest and attitudes are relevant. While dealing with each particular topic it is possible to identify the situations where these could be formed, developed and strengthened. Without going into the specific subject units, the workshop attempted to list below some of the possible specifications of the objectives in these areas, together with a list of how teachers may facilitate and help in their achievement.

Appreciation of the Contribution of Science

Pupil	Teacher
Participates in discussions on scientific subjects.	Encourages pupil participation, permits them to express their ideas and creates situations for free expression and dialogue.
Takes interest in getting acquainted with the lives and achievements of scientists.	Brings forth interesting and creative aspects from the lives and works of scientists, narrates episodes which point out specifically the humanistic and other value components in the lives of scientists. These could include sincerity, commitment, dedication and desire to serve humanity and fellow beings.
Becomes interested in pursuing scientific hobbies.	Provides opportunities for participation in scientific observations, investigations and hobbies. These could include areas that are of immediate concern to the learner, his family and his environment.
Develops interest in discussions and debates on scientific topics and their organization.	Provides opportunities for the same and helps in providing necessary inputs in terms of materials, information and preparations.
Shows interest in visiting places of scientific interest and attempts to understand the processes taking places with keenness and curiosity.	Organizes such visits, accompanies and acquires adequate knowledge and understanding to be able to respond suitably to the questions raised by the learners.
Develops working models of familiar equipment, apparatus and attempts modifications.	Helps in mobilizing and improvising the necessary experiments, encourages innovative ideas and works with students as learning partners.
Takes interest in writing articles and essays on topics of scientific interest.	Encourages and provides necessary materials including those on recent developments, to make the learner feel that he is aware of the latest scientific and technological advances.

Experiences and expresses thrill and excitement on the completion of experiments and understanding of seemingly complex phenomena. Enjoys spectacular experiments and shows a sense of achievement.	Provides opportunities and points out exciting aspects of experimentation, including observation of natural phenomenon, flora and fauna and experiments performed under the laboratory situations.

Developing Interest in Science

Pupil	Teacher
Derives pleasure in being able to understand scientific advances and their impact in the fields of health, nutrition, communication, travel, space explorations and others.	Explains recent advances and acquaints the learners with future possibilities. Keeps himself/herself abreast of new developments.
Manifests a spirit of scientific enquiry.	Demonstrates by his own initiative as to how scientific enquiry could result in exciting and interesting discoveries.
Gets convinced that more inventions and discoveries are possible and even he could contribute to these.	Explains the scientific approach of scientists tists and how they could, through their devotion and perseverance, achieve significant discoveries. Discusses the basic ingredients responsible for inventions and discoveries and how even small observations could really lead to useful discoveries.
Understands the importance of the scientific approach and methods in solving problems relating to human needs, like production of foodgrains, milk, butter clothes/shelter.	Provides examples from the recent past of achievements that have changed the perception of even illiterate individuals towards scientific methods.

Understands the impact of technology in improving the quality of life.	Development of new tools, gadgets, machines and the corresponding utility could be explained with suitable suitable examples.
Understands the inter-dependence of organisms and environment and amongst themselves.	While dealing with various content areas, the teacher can emphasize the needs of human beings to maintain proper balance/relate harmoniously with nature.

Scientific Attitude

Pupil	Teacher
Realizes the importance of keen observation and accepts or rejects anything only after due analysis and with valid reasons.	Explains through specific examples the need for observations, analysis and interpretations before arriving at inferences.
Bases judgements on verified facts.	Demonstrates the utility of sound judgment in various situations.
Is willing to consider new ideas and discoveries and to understand their possible implications and applications.	The way scientific interpretations have changed over a period of time could be explained by examples from the history of science.
Develops independent thinking.	Need to identify problems and arrive at solutions on their own could be emphasized through various curriculum transaction techniques.
Shows the spirit of team work and self reliance.	The way scientists have strived in adverse conditions singly as well as collectively is one of the most interesting aspects of scientific developments.
Realizes the dangers in the misuse of scientific knowledge.	Presents specific cases e.g., Hiroshima 1945, Bhopal-1984 and Chernobyl-1988 as examples where human beings have faulted science and technology.

Chapter Three

APPROACHES FOR FACILITATING VALUES FORMATION

A teaching truism states that there is not one best strategy or approach to teach anything to anyone. This implies that the teacher must be ready to bring about a learning experience for the students through a carefully selected learning/teaching strategy, from a reservoir of strategies the teacher has been equipped with. It is therefore necessary to offer the science teacher an adequate pool of these strategies relevant to the development of the subject of and values in focus.

For values formation in science and technology, varying strategies may be used in the school, in the classroom, and outside the school. Values learned in school must be related, enriched and extended to the home and to the community. As such, the students' valuing experiences inside the classroom are continuously and consistently followed up outside the school through the provision of projects/activities that the students may do individually or in groups. Some of the strategies that have been used by participating countries are indicated below:

In-School Approaches

Experiential and Participatory Approach

This is a learning approach that maximises involvement and participation of the students through carefully planned activities prepared by the teacher. Some programmes call these activities 'structured learning experiences' which allow all the students to participate in, through individual or group activities.

The prepared learning activities put the students into some kind of experience, direct or simulated, for them to do their own introspection/ reflection, to feel or react, or to determine consequent actions or decisions relevant to the learning situation. The experiential activity gives each student an opportunity to go through a process of valuing, understanding his feelings and thoughts about the situation and committing himself to a consequent action. Values, therefore, are not directly taught nor imposed, but the students are guided to 'catch' the values in the learning experiences.

Individual experiences in the activity may be shared with a small group for further clarification and understanding of their Earnings. Thus, within a specific lesson, each student would have

been given an opportunity to be active either. on his own or with the group.

Integrated Approach

If values are to be infused with a subject content, strategies for integrating both the lesson content (e.g., science), and the values relevant to the content, are necessary. This approach calls for a flowing together of both the cognitive dimension of the lesson and the effective aspect of the values to be integrated. Some educationists call this the ‘confluent approach’. It is aimed to develop simultaneously the two domains of learning in order to effect the third domain, which is the action, the actual manifestation of the learner’s values.

This strategy has been reported by a member country (i.e. Philippines), as the ACES Strategy (Affective Cognitive Experiences for Selfintegration). Values integration is done purposively (not incidentally) and systematically (not sporadic) in order to develop simultaneously the cognitive content of the lesson and the affective/value component. The ACES strategy basically follows on the inductive or discovery methodology. It goes through four phases of learning: activity, analysis, abstraction and application. Basically, it makes use of the experiential learning approach and makes use of the strengths of the major approaches cited in the succeeding section.

Value Learning Strategies

In carrying out the first two listed approaches, there is a host of value learning strategies which were identified by the participants to be useful for values integration in science and technology. These included the following:

a) Values Clarification Strategies which aim to let the learners clarify their positions, thoughts and feelings about certain situations by going through the valuing processes of choosing, prizing and acting.

   Learning activities for the valuing experiences may be in the form of group dynamics, co-operative learning, discussions, guided imagery, role playing, and many more.

   Group dynamics and co-operative learning has been found to be very effective in encouraging students to learn openness, sharing, collaboration, self expression, conflict management, team building, group evaluation, leadership/followership, collective decision making, brainstorming skills, communication skills, group reporting, and group synthesizing, among others. These values are enhanced on top of

the content of the lesson being developed.

Guided imagery or fantasy trip are techniques that allow the students to visualize or imagine scenarios, with all the sounds, smells, colours of things related to the learning activity.

This visualization technique is fast gaining ground because of its potency to stimulate creative thinking. It is considered one of the strategies aimed at developing the power of the right brain. In Science and Technology where more often than not, the left brain is stimulated, this strategy may be necessary for an initial development of a sense of aesthetics and the values of curiosity, harmony, peace, and transcendence.

b) Moral Development Strategies are premised on the theory that the values developed are based on the moral reasoning level or judgement of the person. Decision for action, therefore, is a function of the level at which the person judges whether that action is right or wrong.

   This strategy engages the students to study the pros and cons of certain possible actions and their corresponding consequences before he/she makes any decision for final action.

   mon learning events. It is more appropriate to use issue-based activities involving local situations so as to allow for immediate and more meaningful experiences of the learners.

c) Values Analysis - a problem-solving type of strategy where the students identify a problem or purpose of the learning activity, gather evidence for positive and negative positions about the situations, and then make inferences and conclusions that will represent their convictions about the value-learning situations.

   Individual or group analysis of news materials, local issues/ situations, speeches, science reports, collages, etc., are corresponding learning events.

d) Values Inculcation - is known to be the oldest and most commonly used strategy. It is a direct teaching method through the use of lectures, reinforcement techniques, stories, poems, songs, games and simulation techniques. Multi-media (film-showing, tapes and slides) are identified to be very effective in inculcating/ transmitting values concepts in Science and Technology.

There are many science concepts and values that can be directly taught from the lives of scientists. This can be presented to project the scientists as normal human beings who succeeded because of their qualities and values which they have developed through their hard work, persistence, devotion and genuine commitment.

Direct teaching through moralizing, however, is recognized to have limitations especially for adolescents who by nature are indifferent or react negatively to techniques of prodding, nagging and pure lecturing. Values inculcation strategies may be used more effectively, if these are preceded or accompanied by meaningful experiential and clarifying activities.

Face-to-Face Interaction with Resource Persons

In a subject like Science and Technology, there are many Yearnings, both for content and values, that may be achieved via community human resources. Community members involved in different occupations related to the lesson at hand may be tapped to provide the students a face-to-face interaction with them. Also, scientists available in the community would be able to give up-to-date information about a particular science lesson.

Questioning Techniques

In values development, processing questions are helpful in making the students understand better their feelings and thoughts about the value being developed. These are effective processing questions asked by the teacher that relate to the personal experiences, observations, attitudes or personal feelings than cognitive questions such as the what, how or why of the concept. This is purposely done to appeal to the student's effective state to lead him to a certain commitment to characterize a certain value.

Modeling and the Silent Approach

Role modeling is accepted to be an excellent strategy. The teacher's personable ways, patience, devotion, guiding and accepting ways, often silent or non-verbal, get across to the students easily and effectively.

Structures, rules, regulations or school policies are all forms of 'silent teachers' that encourage the students to develop values of discipline, respect, prudence, responsibility and the like. These are training situations for them to live harmoniously in a macro-system, i.e., the society.

Out-of-School Strategies

Outside the school, values learning may be enhanced with the use of stimulating and creative science activities.

Action Learning Strategies

These are activities that serve as enrichment or application of the value concepts learned in the classroom. Students may work in groups to plan together: (i) the purpose of the activity; (ii) things they need, people involved; (iii) task assignments; (iv) implementing mechanism; (v) getting support from outside; (vi) evaluating the activity and reporting. It is important to note that whatever the science activity/project may be, the teacher sees to it that he/she focuses on cognitive, effective and behavioural components in the planning, execution and evaluation of the activity.

These activities may be in the form of:

a) *Community Reach-Out* - such as a visit to under-privileged, depressed areas or to orphanages, places with victims of calamities, etc.

b) *Social Action or Volunteer Work* - which encourages students to assist in the hospitals, clinics or rural health centers, census work, health and nutrition projects.

c) Research and Project Work - on topics like honesty of vendors and their weighing scales in the markets, or projects involving greening backyards, cleaning rivers or experimental researches related to class lessons, projects on superstitious beliefs and scientific truths, projects on collections (e.g. insects, leaves, shells, flora and fauna).

d) *Site Exposures or Field Trips* - visiting polluted areas, factories, denuded forests, science parks, museums and science exhibitions.

e) *Media Awareness Education, Peace Campaigns and the Like* - such as conducting assemblies, forums, lectures aimed to raise the community's level of media awareness and to enjoin others to rally behind good and responsible media. Peace campaigns may also be done through poster-making, parades in the community, and essay writing contests.

Parent-Teacher Activities

In any form of learning, it is crucial to involve the parents who play a vital role in the learners' development. There is a meaningful learning atmosphere when the students know that their parents are concerned about their activities in the school. Guidance, support and direction help in reducing, if not eliminating, value confusion on the part of the students.

Science Club Activities

Science clubs may be encouraged to add value-laden activities through games; creative expression such as painting, drawing, drama productions; leadership training; camp outs; co-operative learning; team building, big brother/sister supportive relationships, science quizzes, exhibitions and fairs, debates and symposiums.

Materials for Further Learning

Students may be oriented to supplementary reading materials in science for the enhancement of their learning in school. Structured modules (e.g. Malaysia's) may be designed for self-learning or with the help of the parents or with specific groups (e.g. Learning Action Cells - LAC in the Philippines) as supplementary to what has been taken up in the classroom.

Teacher Training Strategies

Admittedly, values development and values integration in science and technology, require special teaching competencies in addition to the normally required skills of the science teacher. The teacher needs to recognize the significance and the crucial need for these programmes as demanded by the times.

Cognizant of this demand, teachers must be encouraged to take positive steps in updating themselves with the needed competencies in order to meet the demands.

The following are suggested for consideration in teacher training:

Teachers' Values Orientation or Formation

Teachers' value awareness level must be enhanced. They must understand their significant role in the values development of their students.

They must learn to direct themselves towards the values worthy of emulation by themselves.

Self-development with a direction to raise themselves to the higher level of values is the primary aim of these sessions. Consequently and naturally, commitment to act for the common good (for the family and others, concern for national and global value issues) are necessary components that may be included in this phase of teacher training.

Training in Learning/Teaching Strategies

Rather than leaving the teachers to select the strategies, it is important that they are made to understand the ethical and psychological principles that go with specific strategies previously described. Equally important is their ability to be flexible, resourceful, creative in the use of these strategies. They have to see the strengths and limitations of these approaches and strategies so that they may be able to adapt them appropriately in classroom settings.

It may be helpful to employ process-based training modalities so that the teachers learn the trade as they experience the processes that go with what is being learned. Participative learning is one effective strategy to actualize the maxim 'learning by doing'. Teachers are known to have a rich reservoir of experiences that can be shared and taken as good resources of new Earnings. Learning can proceed in a psychologically pleasant atmosphere with the values of openness, trust, acceptance, respect, sincerity elicited by learning activities such as group dynamics and other experiential training strategies.

Training in Materials Development

In the preparation for classroom teaching, there are instructional materials that the science teacher may need to help him/her in a more systematic and purposive values integration.

Unit plans in Science and Technology may be studied carefully to identify entry points for values integration and to determine which core values or related values may be integrated in specific topics.

Exemplar lesson plans for values integration may also be developed as one strategy to equip the teachers with skills/competencies to integrate values in their science lessons.

Activity sheets, stimulus materials for learning and structured learning episodes may be prepared. During the training, possible sources for these materials may be cited and strategies for the creation, modification, and adaptation may be illustrated to teachers so that they can think of ideas for developing good indigenous materials for value integration.

Training in Evaluation Strategies

The importance of evaluation cannot be overemphasized. If there is a need for training in cognitive assessment, more so with affective behaviour evaluation. This is because of the qualitative nature of the variable measured. Practicable techniques for classroom evaluation may be introduced to the teacher and other helpful strategies for validating classroom assessment may be added. Observation outside the classes, triangulating assessment techniques (parents, peers, teachers) may be workable. There are many non-traditional strategies for evaluation that the teacher can choose from, depending on the purpose of evaluation.

Training Strategies

Certainly, the problem of equipping the teacher with the aforementioned competencies cannot be settled by traditional seminar lectures only, without coupling them with more dynamic training methodologies such as the following:

1. Use of multi-media techniques;
2. Group dynamics, group discussions, consensual decision-making, group workshops;
3. Sharing of teaching experiences and student observations;
4. Micro teaching/simulation;
5. Workshop seminars;
6. Observation of teaching demonstrations; and
7. Participatory/andragogical sessions for self-development.

Chapter Four

EVALUATIONOF VALUES

Values have cognitive and affective bases. These involve behavioural components because a value perception when activated leads to action.

Besides subjectivity of the teacher, the other major problem is that student responses in paper and pencil tests, may not be true. There are two other inherent problems: the competitiveness among the students of showing the better development of value; and difference in their behaviour in a different setting. Nevertheless the complexity in the nature of value assessment should not prevent the teacher from assessing the value.

In the participating countries, evaluation is treated as an integral part of education at all levels of school education. Many have been using formative and summative evaluation practices and frequently the emphasis has been on continuous evaluation of cognitive abilities. Of late the need for evaluation of pupils' affective qualities is being felt. In some countries the Ministries of Education (e.g. India, Thailand, Philippines) have delineated certain core values and are requiring the schools to develop them through relevant integrated or other appropriate approaches.

It is against this background that the participants discussed the issue of evaluation of values. The evaluation procedures/practices/strategies followed for evaluating affective qualities are not only diverse but are also at varying stages of evolution, development and implementation. Evaluation techniques for assessing value learning outcomes depend upon the contextual situations, and the nature of the values themselves. The actual evaluation of value outcomes takes the form of obtaining, as objectively and reliably as possible, a measure of the actual and natural behaviour of the learner in different situations manifesting the value of interest.

The participants felt that as far as the conceptual awareness and understanding of different values is concerned, it is possible to assess them reasonably well by using paper-and-pencil tests specially designed for the purpose. Similarly, the opinions, convictions and attitudes of students towards values can also be reasonably assessed through carefully developed attitude scales (Likert, Semantic Differential) and other kinds of rating scales, inventories, checklists, opinionnaires/questionnaires and projective techniques. However, the assessment of the extent of value internalization as reflected in

actual behaviour in daily life contexts is difficult but not impossible to evaluate.

The participants discussed the different procedures/practices/ strategies that could be used for evaluation of values. It was felt that the practice of using formative, diagnostic and summative evaluation may be followed for evaluating outcomes in both cognitive, affective and psychomotor domains. Such evaluation practices should also be continuous, comprehensive and improvement oriented. The assessment of the extent to which the student has imbibed values is very complex and entails the use of many kinds of information and data collected through various test and nontest ways.

Evaluation Approaches/Techniques/Strategies

The following approaches/techniques/strategies were discussed and suggested by the workshop:

Paper and Pencil Tests

- **Attitude Scales/Rating Scales:** are used for measuring pupil attitudes. Likert and Semantic Differential type of scales are also often used. Ratings by science teachers and other teachers, heads of schools, parents, peer group members, and self-ratings are all useful in assessing values.

- **Questionnaires/Opinionnaires/Checklists/Inventories:** Depending upon the purpose, use can be made of carefully developed questionnaires/opinionnaires directed towards assessment of specific aspects of affective behaviour. They could be used for survey purposes and could be filled in by students, teachers, parents and others. In addition to the usual type of items calling for information, some open-ended items could be included on specific aspects of values.

- **Observation Methods/Interview/Case Studies:** Direct and systematic observations of pupils is by far the most valid approach for the evaluation of values. This could be carried out by all teachers in the school, peers, parents and others who are in close contact with pupils. All observation is to be done without allowing the students to know that they are being studied (least they make fake behaviours which are desirable than display actual behaviours). Observation schedules could be developed and the data on these could be a good supplement to analyse and interpret data from other sources. Structured or unstructured inter-

view techniques also can be used profitably for value evaluation purposes.

Case studies of pupils who show evidence of values internalization and who do not, would throw light on the effectiveness/impact of values education programmes, and help planning remediation measures.

- **Moral Dilemmas and Situational Analysis:** Moral dilemmas, both general and subject specific, could be developed, standardized and used as tests of values. Situational analyses and moral dilemma techniques have similarities since both present a brief account of certain incidents or happenings or dilemmas involving moral or ethical values and the respondents have to suggest the action they would take to solve the dilemma. The situational analysis approach may also involve enactment of role playing to describe incidents and calling for analysis and decisions.
- **Projective Techniques:** Many variations of this approach could be used. Story writing based on pictures presented, sentence completion tasks involving values, completion of incomplete stories etc. are some of the examples. The assumption behind the projective techniques is that the respondent would project his ideas, feelings, beliefs, etc in responding to such tasks. The scoring, analysis and interpretation of responses to such techniques requires special training.
- **Creative Self Expression:** In this technique, certain science themes reflecting values are given and the respondents are asked to write short stories poems/plays/drama/songs or draw pictures. These also involve the projection of one's self into the activity. They are analysed for the value components.
- **Critical Incidents or 'One moment in time' Approach:** A related approach is to ask students to recall incidents related to values which they have experienced and narrate or write the same. Another approach is to present actual newspaper/magazine, reports of incidents reflecting values and requiring students to answer questions based on them. The answers are analysed in terms of values reflected. Both general and science-specific incidents could be used.

Assessment of Values through Project Work and Other Science-related Activities

Science teachers can also take into account the participation of the pupils in numerous science activities and projects. These afford opportunities to observe the development and reflection of affective qualities of behaviour such as, co-operation, neatness, self-discipline, concern for others, appreciation of the contributions of scientists, compassion, suspension of judgement until enough evidence is available, pursuit of truth, perseverance, open-mindedness, ecological concerns and protection of environment, use of science and technology for promoting human welfare and happiness etc. The teacher has to record her observations and use these as supplementary information for evaluation of values.

Development and Use of Evaluative Criteria

One of the approaches is to develop evaluative criteria for assessing each value that is deemed desirable. This involves the identification and listing of behaviours which are indicators of values internalization. Such criteria are to be developed for each value. The development of such indications of behaviour should be based on as many contexts (both general and science specific) as possible. The teacher can use these with students and assess their values development. She can prepare value profiles year after year for each individual and for the class as a whole. These would help in understanding the progress of each student, as well as the class in the development of values. Such an analysis and study would give feedback to the teacher and also help in the larger context of the evaluation of the total programme of values-oriented education.

To measure the progress of values development, some considerations are relevant. These include questions such as:

- Is the student able to actualize the desired behaviour?
- How often and widely is the behaviour demonstrated?
- Is the behaviour consistent over time?
- Is the motivation for behaviour an internal or external one?
- Is it for selfish purposes?
- What is the significance of the behaviour?

If the teacher has to find out whether a value has been developed in a student or not, she will have to observe the indicators related to that particular value.

Example

Respect for others as a value. Some indicators of behaviour:

- Greets his teachers in school;
- Greets teachers outside school and whenever he meets them;
- Greets his parents;
- Listens to his parents and elders;
- Greets his peers;
- Advises friends to greet elders/teachers;
- Stands up when teachers come to him;
- Tells others that greeting is good manners;
- Curious to know the greeting behaviour of people of different regions/countries;
- Appreciates different forms of greetings;
- Identifies respectful behaviours/characters in stories/films;
- He takes initiative in greeting new comers to the class;
- Greets visitors coming to his house.

Programme Evaluation

The programme of values-oriented science education has also to be evaluated. Both cross-sectional and longitudinal studies on the effectiveness of the programme using appropriate methodology, tools and techniques, may be undertaken in a phased manner.

Problems in the Evaluation of Values

The workshop was cognizant of the problems associated with evaluating values. The discussion on the subject led to the identification of the following:

- Defining the term 'values'in a way that is acceptable to all.
- The nature, number and complexity of values.
- Lack of know-how on the growth and development of values.
- Non-availability of suitable instruments to measure values.

- Subjectivity in the approaches to values evaluation.
- Lack of evaluative criteria.
- Lack of commitment/faith on the part of teachers. Over emphasis on cognitive aspects to the neglect of affective and psychomotor aspects.
- Lack of know-how on the integration of values with content and learning/teaching.
- Lack of training for teachers in values-oriented learning/teaching.
- Lack of co-operation among teachers and absence of team spirit.
- Overcrowded classrooms and pressure of examinations.

Chapter Five

RECOMMENDATIONS

The developing countries in Asia and the Pacific are striving to universalize elementary education, in line with recommendations of the Jomtien Conference on 'Education for All'.

Education for all must give rise to greater social equity and equality of opportunities to all. This could lead to greater awareness of fundamental rights. Education needs to ensure equal emphasis on awareness of the duties of citizens. This requires focus and concentration on values components in education. Knowledgeable, aware and awake, people have to learn the skill of managing conflict situations amicably which may arise as a consequence of impacts of change on social and cultural systems. Achievement of universalization of basic education could result in greater awareness and appreciation of the changes taking place under the impact of scientific and technological developments. It could contribute substantially towards removal of ignorance, superstition, obscurantism and irrational practices. Science and technology influence all aspects of human activity including the interdependence of man and nature. Enhanced efforts on social understanding to ensure a balance between tradition and modernization may be stimulated. Situations of value dilemmas before societies need to be resolved, with an eye on the future. Greater resource mobilization and its equitable distribution may emerge as a major thrust from developing countries.

Action Points

The workshop suggested the following action-points in the context of developing the affective domain:

- Universalize science education on par and along with universal elementary education.

- Strengthen Teacher Education Institutions in terms of use of new educational technologies and in capacities to develop indigenous software, suitable for teachers and parents.

- Initiate action to review, revise and rewrite science curricula to meet the new challenges.

- Make values education in science as a basic focal point along with development of cognitive, psychomotor and intuitive aspects.

- Encourage action-learning in science in schools, and outside schools. Schools need to have basic infrastructure for this.

- Make science teaching child-centered, participatory and interesting. Towards this is the need to shed several of the prevailing practices, such as teacher-centred learning, rote learning, etc.

- Emphasize linkages of science learning and its utility all along the learning/teaching process.

- Encourage outside the classroom learning of science.

- Develop rational outlook, analytical approach and appreciation for the contribution of science. This will have to be emphasized through regular lessons, general discussions and interaction with skilled and professional persons.

- Emphasize that every learner can carry out scientific investigations.

Science and technology would be everywhere, in every aspect of human activity, especially in the 21st century. It has to be utilized for maximum benefit to the largest number of persons.

Recommendation for Follow up Actions at Country Level

- Organize discussions, seminars, lectures on values education through science education at each level, i.e. national, regional, district, school cluster and school itself.

- Teacher preparation institutions undertake the exercise of evaluating values education components in the curriculum and augment and replenish the same.

- Programmes of orientations of headmasters, educational administrators, planners invariably devote at least one session to discuss concepts and formation of values as a necessary component of the educational process.

- Every teacher, at each stage, is made well aware of the fact that she is a teacher of values no matter what discipline she is in, and apart from her regular assignments in school.

- Innovative practices being tried out in selected institutions and by voluntary organizations need to be studied, analyzed and disseminated.

- Educational journals be persuaded to feature regularly aspects of values formation, to motivate and guide the educational personnel, particularly teachers.

- Parent Teacher Associations (PTAs), may be requested to debate the issue of values formation in their meetings and devise strategies to be of mutual assistance to all the members.

- Setting up of science and technology parks may be encouraged. Facilities suitable for schools may be devised, which may not necessarily require much resource input.

- National and regional level resource centres for values formation could be conceptualized. Alternatively, existing institutions, say in science education, could be augmented to function as Institutes of Science and Value Education.

- Development of supplementary reading materials be assigned to identified institutions and persons of proven creative ability to assure its easy and wider distribution. These may focus on science, technology and its societal impacts affecting values.

- National, state and regional level exhibitions on values for the scientific society in the 21st century may be organized.

For UNESCO and Other International Agencies

The following are the participants' recommendations for follow-up actions for UNESCO and other international agencies, as based on this workshop's results and outputs.

- Send copies of the report to policy-makers and curriculum developers of each member country with requests for comments, reactions or suggestions regarding possible implementation of the values integration scheme proposed in the report. A survey may be done to determine the feasibility of member countries to implement such programmes.

- Sponsor training workshops in the countries.

- Develop video cassettes and/or exemplar lesson/activities for use in training programmes in the member countries.

- Organize a similar experts' workshop for the development of source books/handbooks, textbooks or multi-media packages, for values integration in science and technology for primary and secondary levels.

- Develop a system to disseminate relevant reading/learning materials to all member countries.

- Organize a follow-up of this workshop with focus on values evaluation, research, and teacher training.

- Organize a follow-up workshop for the participants, to review progress/development of in-country programme implementation.

As this UNESCO-PROAP Workshop had produced worthwhile outputs, it is hoped that the member countries will take the initiative to put the products of this workshop into good use.

Annex I

LIST OF PARTICIPANTS

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The Asia and Pacific Programme of Educational Innovation for Development (APEID) has as its primary goal to contribute to the building of national capabilities for undertaking educational innovations linked to the problems of national development, thereby improving the quality of the people in the Member States.

All projects and activities within the framework of APEID are designed, developed and implemented co-operatively by the participating Member States through nearly 200 national centres which they have associated for this purpose with APEID.

The 29 Member States participating in APEID are Afghanistan, Australia, Bangladesh, Bhutan, China, Democratic People's Republic of Korea, Fiji, India, Indonesia, Iran, Japan, Lao People's Democratic Republic, Malaysia, Maldives, Mongolia, Myanmar, Nepal, New Zealand, Pakistan, Papua New Guinea, Philippines, Republic of Korea, the Russian Federation, Samoa, Socialist Republic of Viet Nam, Sri Lanka, Thailand, Tonga and Turkey.

Each country has set up a National Development Group (NDG) to identify and support educational innovations for development within the country and facilitate exchange between countries.

The Asia and Pacific Centre of Educational Innovation for Development (ACEID), an integral part of the UNESCO Principal Regional Office for Asia and the Pacific in Bangkok, co-ordinates the activities under APEID and assists the Associated Centres (AC) in carrying them out.

In the fifth cycle of APEID (1992-1996), three major programme areas have been selected by the Member States at the Twelfth Regional Consultation Meeting on APEID (August 1990) for the purpose of concentration. These are:

1. Primary education

2. Reorientation and qualitative improvement of secondary education (including general education and technical/vocational education)

3. Science and technology education (including Science for All, mathematics and information processing).